

The femora are very swollen. In addition to the lateral teeth of the petiole, this segment bears a small sharp tooth beneath. The postpetiole bears on each side behind a small tubercle carrying a short stiff hair.

1 ♂, South America (Dr. Swale).

Type W.C.C. coll.

Observations on the Family Coleophoridae.

By ALFRED SICH, F.E.S.

(Continued from vol. xxiii., page 133.)

In the last observations I described some of the different forms that occur in the ova of this family. Here the period of time spent in the oval stage can have no influence on the form of the ovum because all the species mentioned lie in the ovum for the same period. This is curtailed or extended by the degree of warmth existing in the atmosphere during the time and ranges in my experience from ten days to three weeks. I believe these periods will stand good for all Coleophorids under normal conditions. As a rule in England the eggs of the early flying species are laid in May and those of late ones, mostly seed-feeders, in September, but the great majority of species being on the wing in July will oviposit in that or in the following month. The rule will I think hold good for central Europe but not for the south. On the shores of the Mediterranean Sea, the great home of the Coleophorids, much of the vegetation is dried up in July and the moths probably lay their eggs earlier in the year. Although the ova exhibit so great a variety of form the larvæ that hatch out of them are in all particulars except one very similar. In 1904, I called attention to the fact that certain larvæ of this genus have lost the fourth pair of ventral prolegs (*Proceed. South Lond. E. and N.H. Soc.*, 1904-5, p. 9). In this respect these particular larvæ resemble those of the genera, *Gracilaria*, *Lithocolletis* and one or two others.

Since February, 1904, some thirty additional species of this genus have been examined. I believe the presence or absence of ventral prolegs is not a factor of great phylogenetic significance. To most Lepidopterous larvæ they are a convenience, but to some they are not useful or necessary in early life and they then appear only at a later stage. In the Coleophorids, as far as I have observed, the newly hatched larva is already provided with these processes. The Coleophorid larva possesses three pairs of well developed true legs, and though in freedom not a very active caterpillar, it has to move about its foodplant and it does so by means of these true legs only. The newly hatched larva of *fuscelinella* uses its true legs only when after leaving the egg shell it seeks a convenient spot at which to commence its mine. It is then unencumbered by any case. In crawling it arches its body upwards dragging the extremity behind, not throwing it aloft as do some newly hatched Psychids. The larvæ when taken out of their cases and placed on a flat surface progress in the same manner. So highly is the centre of the body arched that an inequality in the surface or a breath of air may overturn the larva. It soon, however, rights itself, but it retains the curved position even when lying on its side. The only exception that I am aware of is the larva of *ornatipennella*. In the first three stages of larval existence, this,

when taken from the mine, crawls in the ordinary way without arching the body, and I think it probable that some of the seed-feeding larvæ which only make cases late in life may be found to crawl in the same manner during the earliest stages. But even in the case mentioned the true legs afforded the means of progress. The Coleophorid larva has three or four pairs of *ventral prolegs* and a pair of fairly well developed *anal claspers*. These four or five pairs together are employed during progression to maintain the case in its proper position, and also when the larva is more or less exposed while feeding to withdraw the body into the case when necessary. Besides these functions the prolegs and claspers must perform an important office during the process of skin-casting. It is probably by their means that the old skin is firmly fixed, and while the larva creeps out of it the old skin will be retained in position by the old crotchets belonging to it. These ventral prolegs of the Coleophorids are small, short, and weak, and more difficult to see than those of many smaller larvæ belonging to other families. When taken from its case the larva has a habit of contracting the prolegs to such a degree that when viewed in the lateral aspect it appears to have none at all, but when viewed in the ventral aspect the dark crotchets will usually show where the prolegs are situated. When examining the prolegs it is always well to use the microscope. The larva may be placed on its back on a piece of moistened stamp paper where it will remain long enough to allow of an examination being made. Normally the crotchets on each proleg lie in an anterior and a posterior row not connected, each row consisting of about half-a-dozen points. They vary in number and are occasionally absent. In one larva of *genistae* there were none on one leg and the other legs each carried a different number, while in a larva of *siccifolia* all these legs were without crotchets.

In the genus *Coleophora* there are a greater number of characters present which may be used to distinguish the different species than is perhaps found in any other genus. Besides these characters which may exist in the imago, pupa, larva and ovum, we also have the larval case in its essentially different forms, to consider when we attempt to divide into groups the very numerous species. With so many factors to work on this division would seem to be an easy task but as certain species stand out alone and others show gradations of these characters or apparently strange combinations of them, no hard and fast lines can be drawn, at least with our present knowledge. Nevertheless certain natural groups do exist though we cannot yet clearly define their limits. From certain evidence to be considered later we may conclude that there are two main divisions, the one consisting of those species whose larvæ feed on the seeds of plants, the other containing the species whose larvæ mine in the leaves of plants and further that the seed-feeders are the more ancient of the two. That the loss of the prolegs belonging to the sixth abdominal segment which occurs in some of the larvæ has been brought about by reduction, lies beyond dispute. The cause of this reduction I propose to consider later. There is a group of rather small species whose larvæ feed on the seeds of *Juncaceae*, and in their earliest stages some, probably all of them, live without a case in the seed heads of these plants. This group probably contains the most primitive species now known. All those examined have four pairs of ventral prolegs. They

are the following species: *caespititiella*, *glaucolella*, *obtusella*, and *murinipennella*. Another group may be formed of those species which are marked on the forewings with scattered dark dots as well as pale longitudinal lines. They are chiefly coastal species and feed on *Chenopodiaceae* or *Compositae*. *Laripennella* and *artemisiella* (the latter examined by Mr. H. J. Turner) belong here and both have four pairs of ventral prolegs.

Virgaureae and *argentula* have also four pairs and are the British representatives of what I consider another group. The small group with metallic forewings, whose larvæ feed on the seeds of *Papilionaceae*, probably all have four pairs of ventral prolegs. Unfortunately I had no living larvæ of this group, but I possess two blown larvæ of *frischella* from the late Dr. Mason's collection. These show the four pairs very distinctly. The last of the seed-feeders to be mentioned is *albicosta*, which is one of these species which seem to stand alone. The larva feeds on the seeds of *Ulex europæus*, and probably does not form a case in its earliest stages. It has four pairs of ventral prolegs. There is a small, but highly interesting, group which may be considered as a bridge between the seed-feeders and the leaf-miners. In their youth they eat the seeds of species of *Labiatae*, but after hibernation the larvæ mine in leaves of grasses. One species, *ornatipennella*, does not in reality make a case till after hibernation, but hides itself in a seed-capsule, another, our *livella*, may do likewise. Both these species have four pairs of prolegs. *Goniodoma limoniella*, belonging to this family and feeding in the flower-head of *Statice*, has also four pairs.

Thus we see that in the few larvæ of the seed-feeders which have yet been examined there is no exception, they are all four-paired. Among the leaf-miners *alcyonipennella*, which may belong to the above-mentioned metallic group, also has four pairs. There is a veined group whose larvæ mine in the leaves of *Compositae*. *Therinella*, and *troglydella*, represent it here, they both have four pairs. The larva of *solitariella* also carries four pairs, and so does that of *linolea*. Ottmar Hofmann was the first writer to apply the theory of descent to the Coleophorids, when, in 1869, he described some of the members of the *riminetella* group. All the species of this probably have four pairs of ventrals, *riminetella*, *bicolorella*, and *orbitella*, certainly have.

Paripennella, a member of another unicolorous group, also has four pairs. I believe all the species hitherto mentioned also agree in another character, that is that they only form one case during their larval life. We now come to a pair of small unicolorous species, which in neuration and other particulars are evidently closely allied, one of them, *laricella*, has four, while the other, *juncicolella*, possesses only three pairs of ventral prolegs.

Discordella and *albitarsella*, though widely separated species, agree in two particulars, their larvæ have but three ventrals and form but one case. The group containing, among others, *trigeminella*, *badiipennella*, and *limosipennella*, consists of very similar species; the three mentioned have only three pairs of ventral prolegs. The first of these species may make but one case, the second forms two, and the third three cases. One species, *conyzæe*, differs from those with which it is usually placed in that it makes two cases, it has also only three pairs. *Gryphipennella* and *siccifolia* are closely allied, the former, I believe, and the latter certainly makes three cases, and both have only three pairs of ventrals. Of another group of closely united species,

nigricella, *fuscicellula*, and *lutipennella* occur in Britain as well as *hemerobiella*, which though differing so much in appearance from the others is, I believe, connected with this group. They all have only three pairs of ventrals and all agree in making a somewhat peculiar first case and a second more simple case.

The group of white species whose larvæ spin their cases out of their own silk without admixture of vegetable matter is from the proleg point of view an especially interesting one. The largest species which spins a more complicated case than the others has three pairs of ventrals and there is no trace at all of the fourth pair. This is *palliatella*. In *anatipennella* and Stainton's *ibipennella* there are also only three pairs, but the ventral surface of the sixth abdominal segment, instead of being quite smooth as in *palliatella*, is marked by two scars lying in the situations which would have been occupied by the fourth pair of prolegs had they been present. From this it may be gathered that these two species have lost the fourth pair at a later period. In another group we have *ribicella*, this also has but three pairs of active ventrals, but it still carries the remnants of the fourth pair in the shape of two minute points on the sixth abdominal segment. It is one step behind *anatipennella* in the process of reduction. Among the three-paired species I think we may include *conspicuellula*. The first observer to notice the absence of prolegs on the sixth abdominal was the faithful artist who drew the figures of the larvæ of *limosipennella* and *conspicuellula* in Stainton's *Natural History of the Tineina* (vol. iv., pl. II., fig. 2a, and vol. v., pl. IX., fig. 2a), as both these larvæ are there shown with only three pairs. It is now many years ago since I first noticed these figures, but I believe the sight of them first induced me to examine the prolegs of Coleophorid larvæ.

In considering the loss of the fourth pair of prolegs, as we find four-paired larvæ within the genus, we need not go outside this but from the fact that the allied families, Gracilariides and Lithocolletides, have also lost the same pair, we may argue that there exists a tendency to lose this pair in the group of families forming this particular branch of the stirps. I have already described the arched position assumed by the larva when taken from its case, and I believe it retains this position as far as it is able to do so when carrying its case, that is to say, that the anal claspers are bent slightly under the body in contact with the floor of the case, while the dorsal parts of the abdominal segments are pressed against the roof of the case. The first two or three pairs of ventrals would be, owing to the confined space afforded by the case, also in contact with the floor, but owing to the incurved anal claspers, the fourth pair may be held above the floor. If this be so then it follows that the fourth pair will be less used than the other pairs, and it may follow that from disuse it gradually dwindles away till it is finally lost. This last condition has only been reached by certain species.

(To be continued.)

Seasonal Polymorphism and Races of some European Grypocera and Rhopalocera.

By ROGER VERITY, M.D.

(Continued from page 73.)

Leptosia sinapis, L.—This species produces on the eastern coast of the Adriatic a remarkable race, which by its gigantic size and other